

# Chapter Eleven: Appendix

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Do not walk on drift eliminators, as they are not designed to safely support the weight of personnel.

The Water Collection System and fill media will support the live load of personnel at 200 lbs./ft² (27.7 kg-force), to a maximum of 204 kg total per cooling tower module. <u>Tower Tech recommends avoiding walking on the fill media or Water Collection System</u> unless pieces of one-foot x two-foot (30.5 cm x 61.0 cm) plywood are used for load distribution, to minimize the possibility of damaging fill media and Water Collection System.

- 3. Take note of how the fill media sections are stacked in the tower module.
- 4. Remove the sections of fill media above the area of the Water Collection System that you wish to access and inspect each log for scale, dirt and debris. Any fill pieces that are heavily contaminated by scale, dirt or other debris should be removed from the tower module and power washed. Any fill pieces not contaminated by scale, dirt and other debris can be stacked temporarily on top of other fill elsewhere in the tower module. If necessary, additional drift eliminator sections may be removed to make room to stack clean fill pieces elsewhere in the tower module. Clean fill media may also be placed temporarily on top of installed drift eliminators, provided that no more than one layer of clean fill is placed on top of installed drift eliminators.

When removing fill media, note the location of scale, dirt and debris within the fill media, from top to bottom, i.e. "The top layers of fill contained showed no sign of scaling, but the bottom layer had a slight scale residue." Such information may be helpful as you discuss your tower with a water treater or with Tower Tech's customer service staff.

- 5. Inspect the top section of the Water Collection System for scale, dirt and debris and remove any scale, dirt and debris by power washing.
- 6. Reinstall clean fill media in the tower module in the same way it was installed by the factory.



The ends of Secondary Drainage Channels have been plugged with caulking material at the factory to prevent water leaks. If the caulk is removed, air moving rapidly within the Perimeter Basin Wall can force water flowing in the Perimeter Basin Wall to flow into the Secondary Drainage Channels, quickly filling them to capacity and causing them to overflow. Use care when cleaning Secondary Drainage Channels and Drainage Holes. Do not attempt to force "debris" from the ends of a Secondary Drainage Channel, as doing so may inadvertently dislodge caulking material which helps prevent leaks.

- Dampers. Installed between collector vanes on the bottom of the Water Collection System, dampers are designed to open automatically when the fan beneath it is turned ON, and to close automatically when the fan beneath it is turned OFF. Dampers thereby help contain airborne water drops inside the Water Collection System. Dampers require periodic visual inspection to ensure they are opening and closing fully and freely. Refer to Figure 41.
- Flow-Thru Basin Primary Drainage Holes in the Perimeter Basin Wall allow cooled water exiting the Water Collection System to flow into the Flow-Thru Basin. Refer to Figures 41, 42 and 43.
- Flow-Thru Basin Secondary Drainage Holes in the Perimeter Basin Wall allow any water that escapes primary containment within the collector primary drainage channels to be channeled back into containment within the perimeter basin beam. Refer to Figures 42 and 43.

To access and perform service on the bottom section of the Water Collection System:

- 1. Disconnect the power to the fan by locking out and tagging out the appropriate motor.
- 2. Open the fan screen (remove fan from motor shaft if necessary).
- 3. If a Damper does not fit properly or is sticking, remove the damper from the secondary channel. Each Damper is held in place by an F-shaped side that hinges loosely on the top of the secondary channel. Refer to Figures 41 and 43.
- 4. Clean the bottom side of the Water Collection System with a power washer. Clean both sides of the collector vanes all the way up to the bottom of the fill media.

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- End Caps help hold the collector vanes together and secure the Water Collection System to the Perimeter Basin Wall to prevent leaks. End caps are installed in pairs ~2.5 inches (~6.4 cm) apart at the end of each collector vane. One End Cap is also installed at the center of each collector vane. Refer to Figures 41 and 42.
- Spacers installed ~15 inches (~38.1 cm) apart along the entire length of each collector vane fasten the Water Collection System together. Refer to Figures 41 and 42.

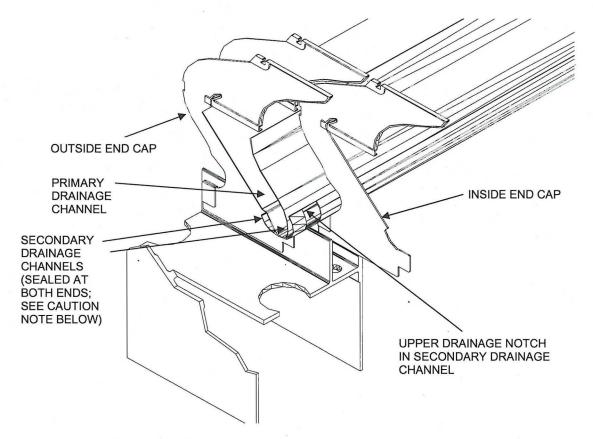


Figure 42 - Close-Up View: Water Collection System

• Secondary Drainage Channels: Located at the bottommost section of a collector vane, secondary channels are designed to capture water drops adhering to the exterior surfaces of a collector vane. If a secondary drainage channel becomes clogged with scale, dirt or debris, it is possible that some water may escape containment. Secondary drainage channels should be inspected periodically, both visually and by feel, to ensure they are free of scale, dirt and debris. Refer to Figure 42.



### 10.1.12 Immersion Basin Heater

Check the system annually, just prior to the start of the winter operating season, as well as anytime the tower is drained.

- 1. Visually inspect probe, panel, and heater for physical damage, evidence of overheating, loose connections, leaks, etc.
- 2. Make sure that the conduit plugs are in place for unused connection ports in the heater element wire box.
- 3. Visually inspect all wiring insulation for integrity and connections for tightness.
- 4. Wipe sensor probe to remove any build-up.
- 5. Verify that tower water quality is being properly maintained. Specific attention should be paid to excessive chlorine levels that may shorten heater lifespan.
- 6. Refer to Section 9.4.3 for details on test procedure to verify that the immersion basin heater energizes properly.

Exercise caution when servicing or troubleshooting the immersion basin heater. Always refer to the basin heater user's manual before starting work. Only qualified personnel should perform maintenance on the immersion basin heater.

## 10.1.13 Water Collection System

The TTXL Series Water Collection System is an effective air-water separator that will operate trouble-free for extended time periods if it is periodically inspected and maintained as prescribed herein. The Water Collection System also supports the weight of the fill media and the design water load.

The WCS is permanently installed in the tower module with hardware and caulking materials. Non-Tower Tech factory personnel should never attempt to lift or move the Water Collection System as doing so can permanently damage the tower and void the tower warranty.

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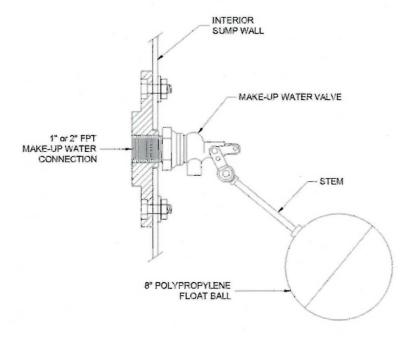
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3. Using proper sized wrench, unscrew the valve from the threaded flange.

To install the float valve:

- 1. Attach valve to threaded flange.
- 2. Valve outlet must be pointed straight down.
- 3. Screw rod and float to adjusting arm.
- 4. Adjust float for desired water level (refer to Figure 39 for details), then tighten adjusting bolt.



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Figure 39 - Mechanical Float Valve



- 9. Carefully separate the fan shell halves by removing the upper half to expose the fan blades.
- 10. Locate the index tab on the fan blade, exchange with new index tab for the new pitch angle. Fan Pitch is determined by which index tab is installed to achieve the correct setting.
- 11. Once the pitch is established by installing the correct index tab for all blades of the fan, replace upper fan shell half and tighten the hub bolts to hold the blades firmly in place. Replace Uniboss center hub and all balancing washers and nuts to their original locations.
- 12. Recheck the blade pitch after tightening the bolts to ensure that the pitch is correct and record the new pitch setting.
- 13. Verify that the shell half bolts and Uniboss hub bolts are torqued to 12 ft. lbs. (58.6 kilogram-force/ m²) using a torque wrench.
- 14. Re-install the fan assembly onto the motor shaft.
- 15. Check that the fan is not hitting the shroud.
- 16. Verify that the taper lock bushing bolts to Uniboss hub are torqued to 12 ft. lbs. (58.6 kilogram-force/m²) using a torque wrench.
- 17. Replace the Fan Guard Screens.
- 18. Remove lock-out/tag-out.
- 19. Check the fan operation for proper rotation to ensure that there are no other problems and return the unit to service.

#### 10.1.8 Fan Motors Removal / Installation

Use lock out/tag out procedures to prevent damage to equipment or personnel when maintenance is required on fan guards, fans, or fan motors.

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# 10.1.5 Fan Replacement

When maintenance is required on fan guards, fans or fan motors it is imperative that lock-out, tag-out procedures be strictly adhered to prevent damage to equipment or personnel.

Fans are pitched and aligned during assembly. Recommended clearance between fan shroud and fan tip is 1/16-inch (1.6 mm) minimum and 1/2-inch (12.7 MM) maximum. Tower Tech sets fan tip clearance at ¼-inch (6.4 mm) to 3/8-inch (9.5 mm) in the factory. Fan tip clearance should be checked monthly.

### To remove a fan:

- 1. Disconnect power from motor, locking-out and tagging-out the motor/fan to be worked on.
- 2. Open the fan guard.
- 3. Support the fan.
- 4. Remove the bolts from the fan bushing.
- 5. Thread the bolts back into the threaded holes that are provided in the bushing.
- 6. Begin tightening the bolts into the bushing evenly until fan is pushed off the bushing. Use a gear-puller if bushing doesn't come off easily.
- 7. While supporting the fan, tap the bushing gently off the motor shaft.
- 8. Remove the set key from the motor shaft.
- 9. Lower the fan to the ground.
- 10. Mark the fan so that it may be re-installed on the same motor from which it was removed.

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To remove the Rotary Spray Nozzle:

- 1. Expose the Rotary Spray Nozzle by removing the drift eliminators that restrict access.
- 2. Remove the section of fill media directly below the Rotary Spray Nozzle.
- 3. Remove the small set screw in nozzle head that locks the Rotary Spray Nozzle in place.
- 4. Using a strap wrench, unscrew the Rotary Spray Nozzle.
- 5. Individual Rotary Spray Nozzle components not sold separately. Disassembly of Rotary Spray Nozzle voids nozzle warranty.

If a cooling tower module is valved out seasonally without adjusting flow rates across the remaining cooling tower modules, the Rotary Spray Nozzle's upper flow limit of 320 gpm (20.2 lps) may be exceeded and result in damage to the remaining online nozzles.

#### 10.1.4 Fan Guards

When maintenance is required on fan guards, fans or fan motors it is imperative that lock-out, tag-out procedures be strictly adhered to prevent damage to equipment or personnel.

Fan guards are mounted in a frame with convenient hinged access. Regularly check the guard for large items such as paper or leaves that might be sucked against the guard. It is important to the performance of the cooling tower that any air restrictions be removed.

To replace a fan guard (refer to Figure 37 for close-up of hinge hardware):

- 1. Turn off fan and lock and tag out power.
- 2. Remove the six 1/4" bolts that hold the screen angle to the tower mid basin and perimeter wall using a 7/16" wrench.

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#### 10.1.2 Fill Media

Distribute personnel loading on the fill media by placing a flat surface, such as a piece of plywood, atop the fill media to prevent damage to the fill and Water Collection System while walking on them.

Inspect the cooling tower fill media regularly depending on the quality of the water being circulated. A typical inspection includes removal of pieces of fill media from all fill layers (starting from the top). Visually inspect the flute openings on the bottom side of the piece to determine if any build-up of algae, bacterial slime or solids has occurred. If build-up is significant, it may be necessary to remove the fill media and clean with water and mild detergent as described for the drift eliminators. If algal growth or bacterial slime is detected, please contact your water treatment professional to control the problem. Overzealous cleaning methods may cause damage to cooling tower components.

Bacterial slime can contribute significant weight loads on the tower beyond that for which it was structurally designed. Damage to tower internals or shell due to bacterial growth excursion will void the TTXL Series Modular Cooling Tower warranty.

### 10.1.3 Rotary Spray Nozzle

TTXL Series Modular Cooling Towers utilize patented Rotary Spray Nozzles. This nozzle has a large four-inch orifice and a rotating disc that will dislodge nearly all debris commonly seen in cooling towers. While it is unlikely that the nozzle will plug during normal use conditions bi-annual inspection of the nozzles is recommended.

Inspecting the Rotary Spray Nozzle consists of visually inspecting the water distribution pattern. If sticks or large objects are jammed in the nozzle, follow the instructions for removal (refer to Figure 36).

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All electrical, mechanical, and rotating machinery constitute a potential hazard, particularly for those not familiar with the design, construction, and operation of same. Accordingly, adequate measures (including the use of a protective enclosure when deemed necessary) should be taken with this equipment, both to safeguard the public from injury and to prevent damage to the equipment and its associated system.

Walking on top of the module is dangerous and could result in serious injury or death. Adequate safety measures must be taken to prevent injury due to falling.

Disconnect any basin heater(s) before draining water from the module's basin. Failure to do so will result in damage to the module, as well as potential for fire to occur.

### 10.1 Maintenance Schedule

TTXL Series Modular Cooling Towers are designed to require minimal maintenance. However, the quality of care they receive will affect their service life. The following schedule is given as a minimum checklist to aid in providing the recommended inspection and maintenance of your unit. Refer to Table 12 for recommended maintenance of TTXL components.

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